"WATER-SOLUBLE CONTAINER"

The present invention relates generally to a water-soluble container.

Water-soluble containers as such are well-known and have a variety of uses, such as in clothes washing. For example, CA 1112534 describes a water-soluble container for a detergent composition. The water-soluble material may be, for example, polyvinyl alcohol (PVOH). This document describes a single chamber with a film form wall of constant thickness. Because the chamber wall is of constant thickness, the entire wall must be dissolved before any product can escape. In certain circumstances product may be required quickly, before the time when the entire container has dissolved.

According to the present invention there is provided a water-soluble container comprising one or more discrete chambers for containing product, at least part of the wall of the or at least one of the chamber/s is adapted to dissolve before the remainder of the chamber to allow product to escape. This means that product can escape from a chamber without requiring complete dissolution of the chamber. This can be useful for decreasing the time taken for product to be released. It can also allow for a greater degree of control over when product is released because the area required to be dissolved is reduced.

A container according to the present invention with more than one chamber gives the possibility for a system combining the advantage of not requiring a whole chamber to dissolve before a product is released, together with the possibility of sequential release of products. In its

simplest form a chamber provided with the means for allowing product to escape before complete dissolution could be associated with a chamber not having those means. More complicated systems could involve chambers which allow products to escape after different times before complete dissolution.

The ability of such containers to provide for sequential release of multiple products is extremely useful. For example, clothing washing usually includes a detergent stage and a stage later in the washing cycle in which a softening agent is introduced. Dish-washing sometimes includes a detergent stage and a separate rinsing stage. In many cases it would be preferable and sometimes essential for different stages of washing operations to be kept completely separate.

By providing for sequential release of products the present invention removes the need for manual intervention at different stages of washing cycles and allows the complete washing product to be packaged and supplied together.

The at least part of the wall will most usually be an exterior surface of the container thereby releasing product from the container when it dissolves. However, it is also possible that the at least part of the wall forms part of a chamber which is housed within another chamber which itself includes water, whereby the contents of the chambers are mixed when the at least part of the wall dissolves. This might be useful, for example, if the product in the inner chamber is activated by product in the outer chamber. This allows activation in a

controlled environment before the activated product is released into the exterior of the container and could be useful for products which become unstable once activated.

There are many ways in which the container could be formed in order that product is released from the chamber when the part of the wall dissolves. For example the part of the wall could itself comprise a closure part which dissolves to form an opening in the chamber.

Alternatively, the part of the wall may define a releasable part. When the part of the wall dissolves the releasable part is released, itself as yet undissolved, to form an opening in the chamber. For example, the releasable part may be a panel and the at least part of the wall at least partly surrounds the panel so that it is released, either completely or partially, when the part of the wall dissolves. Alternatively the part of the wall may comprise one or more clip elements, such as a hook. The clip elements initially clip the closure part to the container but then dissolve and release the releasable part. In this way only a small section of the wall dissolves and yet a large opening can be provided quickly.

There are many ways in which the part of the wall could be formed in order that it dissolves before the remainder of the container. For example, the at least part of the wall could be made from a thinner section of material and/or from a different material with a faster rate of dissolution than the remainder of the container.

In embodiments where the at least part of the wall is thinner than the remainder of the container the

material thinning may be arranged on the interior surface of the chamber wall. This is particularly relevant when the at least part of the wall defines a thin channel, because if the material thinning was arranged on the exterior surface the channel could become saturated with dissolved material, which would impede further dissolution.

In order to simplify production and allow for high volume production the container may be formed by injection moulding. In embodiments where the at least part of the wall is a thin section surrounding a panel, the area of the panel may form the gate region for injection moulding. This ensures that the thin section is correctly moulded by avoiding problems with moulded regions which are remote from the injection point.

As stated above, differential dissolution characteristics may be achieved by forming the container from two or more different materials at least some of which are water-soluble. It may, however, be preferable for simplification of the production process for the whole of the container to be formed from the same material.

In some embodiments at least part of the material from which the container is formed is a polyvinyl alcohol. Alternatively at least part of the material may be a polylactic acid or a starch based material.

The container may be flexible. This may be as a result of the choice of material and/or the thickness of the walls.

Where a container has several walls, the term "wall" can refer to any one or more of the walls. A spherical container, for example, has a single wall whereas a cube has six walls. The term is therefore generic and could refer to any part of the material defining the chamber.

The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Fig 1 is a perspective view of a housing formed as part of a container according to a first embodiment;

Fig 2 is a section along line II - II of Fig 1,

Fig 3 shows the housing of Fig 2 with a lid component attached;

Fig 4 shows the container of Fig 3 following an initial exposure to water;

Fig 5 is a section through a container according to an alternative embodiment;

Fig.6 is a section of a container according to an alternative embodiment; and

Referring first to Figs 1 and 2 there is shown a housing 10 of generally parallelopiped shape comprising a base wall 11, side walls 12, 13 and end walls 14, 15. The housing is hollow and is open opposite the base 11 to form a tray-like structure. The housing 10 is formed from a water-soluble material. The material could be, for example, a grade of PVOH which dissolves at approximately 50°C. The interior of the housing 10 is divided into two discrete chambers 30, 31 by spaced

parallel partition side walls 16, 17 which extend from end wall 15 and are joined at their ends by a partition end wall 18. Each of the partition walls 16, 17, 18 extends the full height of the housing walls 11, 12, 13, 14, 15. The portion of the base wall 14 which is bounded by the partition walls 16, 17, 18 includes a panel 19 surrounded by a region of material thinning 20 the purpose of which will be described in more detail below.

Referring now to Fig 3 the housing of Figs 1 and 2 is shown forming part of a container 1. The housing 10 is closed by a lid 25. The chambers 30, 31 are filled with different products before the lid 25 is applied. The lid 25 includes a panel 26 and region of material thinning 27 opposite and identical to those of the housing 10. The lid 25 may be secured to the housing 10 by any convenient means such as welding adhesion, interference fit or clipping. In this embodiment the seal is a face seal bond which is chemically activated, in this case by water, and supported internally by a wall 28 depending from the lid 25.

In this embodiment the thickness of the housing walls and the lid is approximately 0.4mm. This is about the thinnest that material can be without a risk of 'pin holes' i.e. tiny holes in the material which could compromise the integrity of the chamber. The material thinnings are approximately 0.15mm thick and are formed by reducing a small part of the uniform thickness of the container.

In use, the container 1 is placed in an aqueous environment and the temperature is raised beyond the

dissolution temperature of the container material. As the container 1 begins to dissolve the material thinned regions 20, 27 will completely dissolve before the remainder of the container. As a result, the panels 19, 26 are released from the lid 25 and the base wall 14 such that product can escape from the chamber 31. Of course the panels 19,26 do not have to be completely released to be effective. For example the material thinned regions 20, 27 could extend part way round the panels 19, 26 such that the panels 19, 26 become flaps which hinge open. Product from the chamber cannot escape until the remainder of the container has dissolved.

Referring now to Fig 5 there is shown an alternative embodiment. In this embodiment two discrete chambers 130,131 are formed from two separate, hollow cube-shape housings 110a, 110b which are bonded together along adjacent side walls 112a, 112b. Each housing 110a, 110b is open along one side but closed by a lid 125a, 125b, in this embodiment sealed to the housings by adhesion. The lids 125a, 125b are formed from different grades of PVOH which dissolve at different rates, with the material of the lid 125a having the faster dissolution rate. In this embodiment therefore the lid 125a of the housing 110a dissolves before the lid of housing 110b, to allow its product to escape first.

Referring to Fig.6 there is shown a container 201 with a single chamber 230. A generally cuboid housing 210 comprises a base wall 211 and side walls 214, 215. An open side of the housing 210 is closed by a lid 225.

The lid 225 is held onto the housing 210 by a clip 220 extending from its periphery. The clip 220 engages under a bead 235 formed around the open side of the housing 210.

The clip 220 is thinner than the remainder of the container 201. Accordingly, in use of the container the clip 220 dissolves before the remainder of the container so that the bead 235 no longer retains the lid 225, and therefore allows the lid 225 to be released from the housing 210.